

The Gretina/GRETA Triple Crystal Module*

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A triple-crystal detector module of the Gretina/GRETA array was ordered in September 2002, and delivery is expected at the end of 2003. The design of this prototype integrates all the technology needed for a complete detector module. As shown in figure 1, this module consists of three encapsulated Ge detectors, each with 36 segments, placed in a single cryostat. Each crystal gives 37 signals (from the 36 segments and one central electrode) amplified with cold FETs mounted in the cryostat. Since this module may be regarded as the ‘basic unit’ from which GRETA will be constructed, by accepting the order the manufacturer has indicated that there are no fundamental fabrication issues for the full array.



Fig. 1. Left figure shows the packing of three crystals in the cryostat. The right figure shows the cryostat and the Dewar.

Each crystal, before it is shaped, has a diameter of 8 cm and a length of 9 cm. To simplify the production of this first module, a regular tapered hexagonal shape was chosen. As shown in figure 2 the crystal has a taper angle of 10 degrees between the axis and the center of a flat surface, and the apex of the tapered surface is 15 cm from the front surface of the crystal. The first 5 cm of the crystal are fully tapered, the next 3 cm are partially tapered, and the last 1 cm of the crystal retains the original cylindrical shape

(not tapered). This shape maximizes the distance from the source to the detector, allows more space for an auxiliary detector in the target chamber, and optimizes the germanium coverage of the shell space between 15 and 26 cm. Six longitudinal segmentation lines are placed at the centers of the flat faces. The transverse segmentation

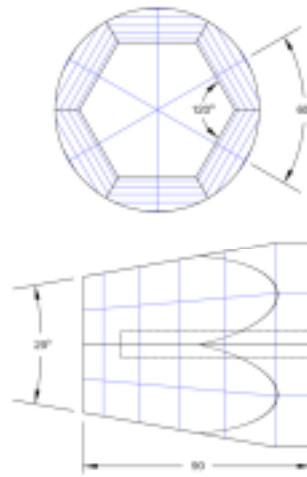


Fig. 2. Shape and dimension of the Ge crystals of the three-crystal module.

separates the crystal into 6 unequal “layers” with thickness of 1.0, 1.2, 1.6, 1.8, 2.0, and 1.4 cm respectively. The crystals are packed closely in one cryostat with minimal gamma-ray absorbing material. The distance between the crystals is 3.5 mm and the distance between the crystal and the cryostat wall is 4.5 mm.

Footnotes and References

*This work was carried out in collaboration with the GRETA Steering Committee